

FIG. 1

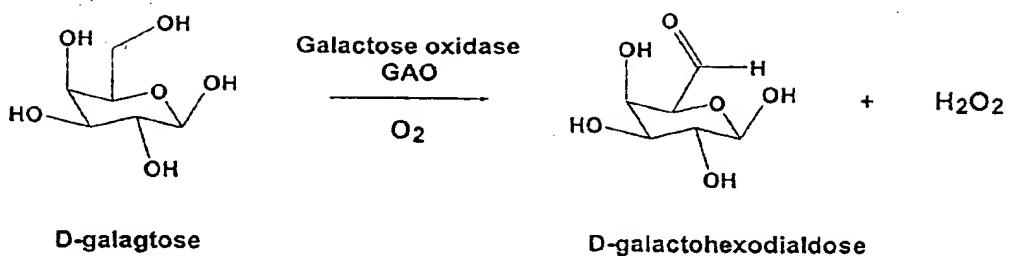


FIG. 2

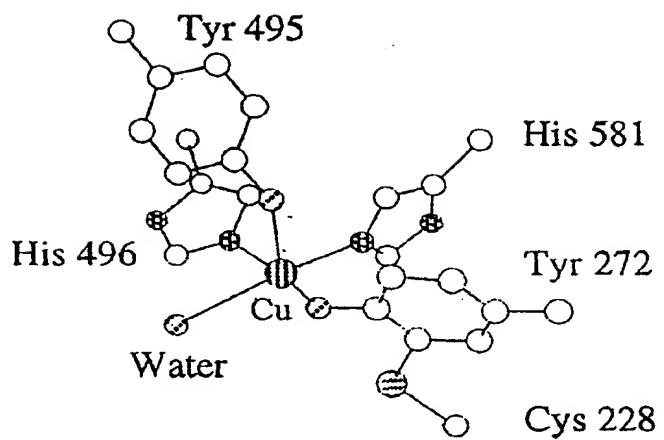


FIG. 3

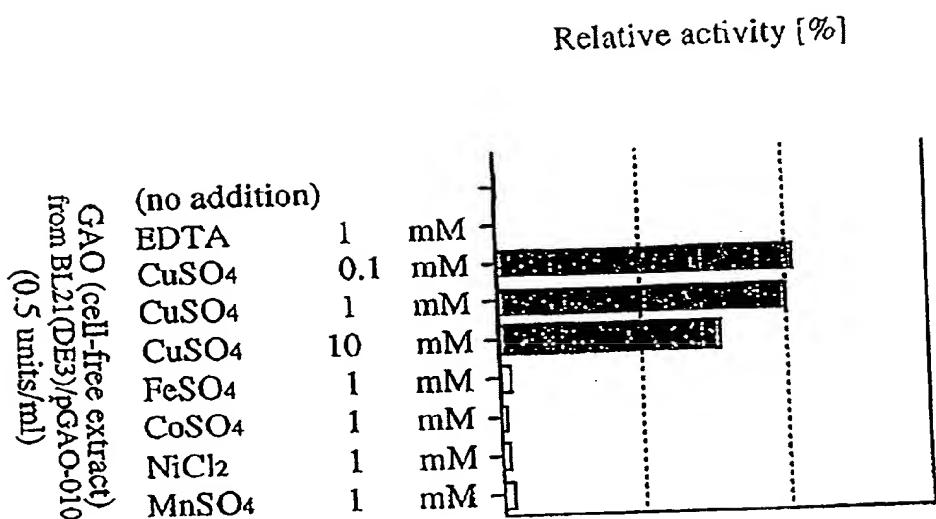


FIG. 4

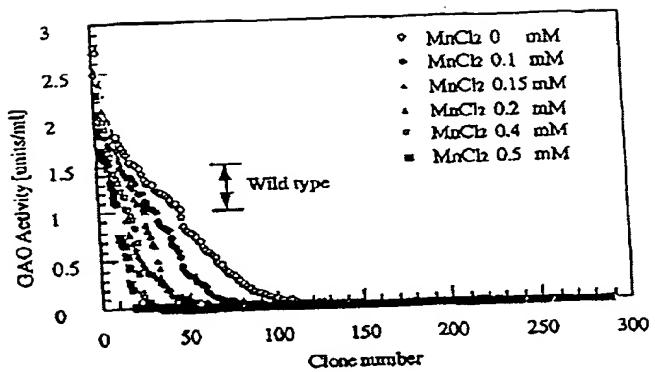


FIG. 5

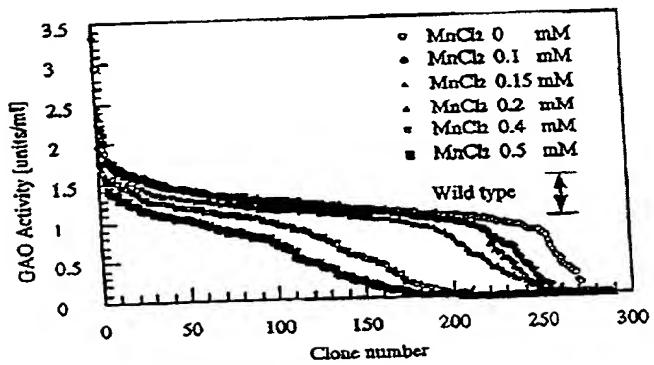
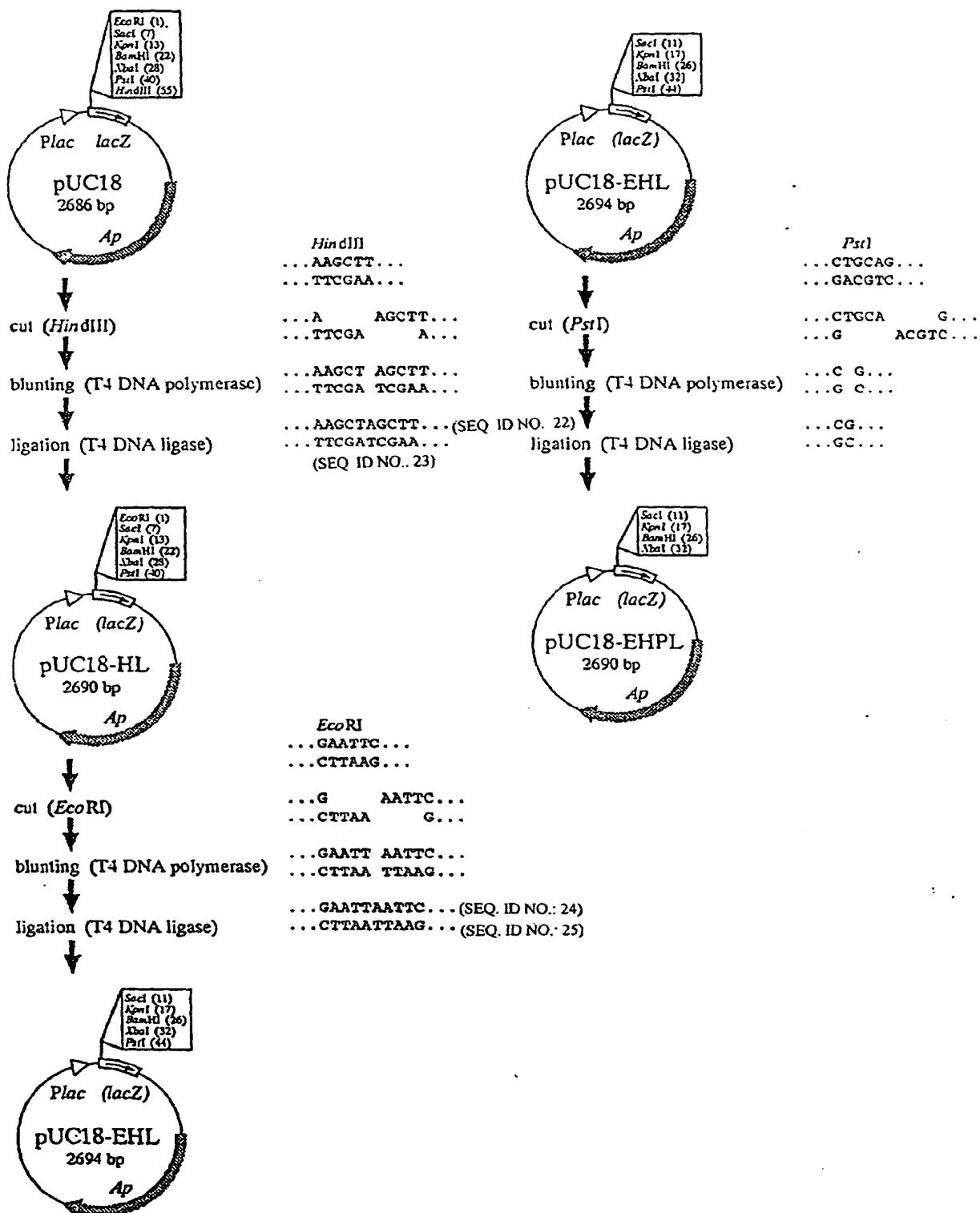


FIG. 6

PCR primers	Sequence	
MY		
001	5'-AAT TCG AAG CTT ATG GCC TCA GCA CCT ATC GGA AGC-3'	SEQ. ID NO 1
002	5'-CTT CCT TCT AGA TTA CTG AGT AAC GCG AAT CGT-3'	SEQ. ID NO 2
003	5'-GGA AGA GAA TTC AAT ACG CAA ACC GCC TCT-3'	SEQ. ID NO 3
004	5'-GGT CAT AAG CTT TTC CTG TGT GAA ATT GTT AT-3'	SEQ. ID NO 4
005	5'-ACC ATG ATT TCG ACG TCG GTA CCC TCA GCA-3'	SEQ. ID NO 5
009	5'-CTT CCT AAG CTT TCA CTG AGT AAC GCG AAT-3'	SEQ. ID NO 6
036	5'-GGA AGA GGT ACC AAT ACG CAA ACC GCC TCT-3'	SEQ. ID NO 7

FIG. 7



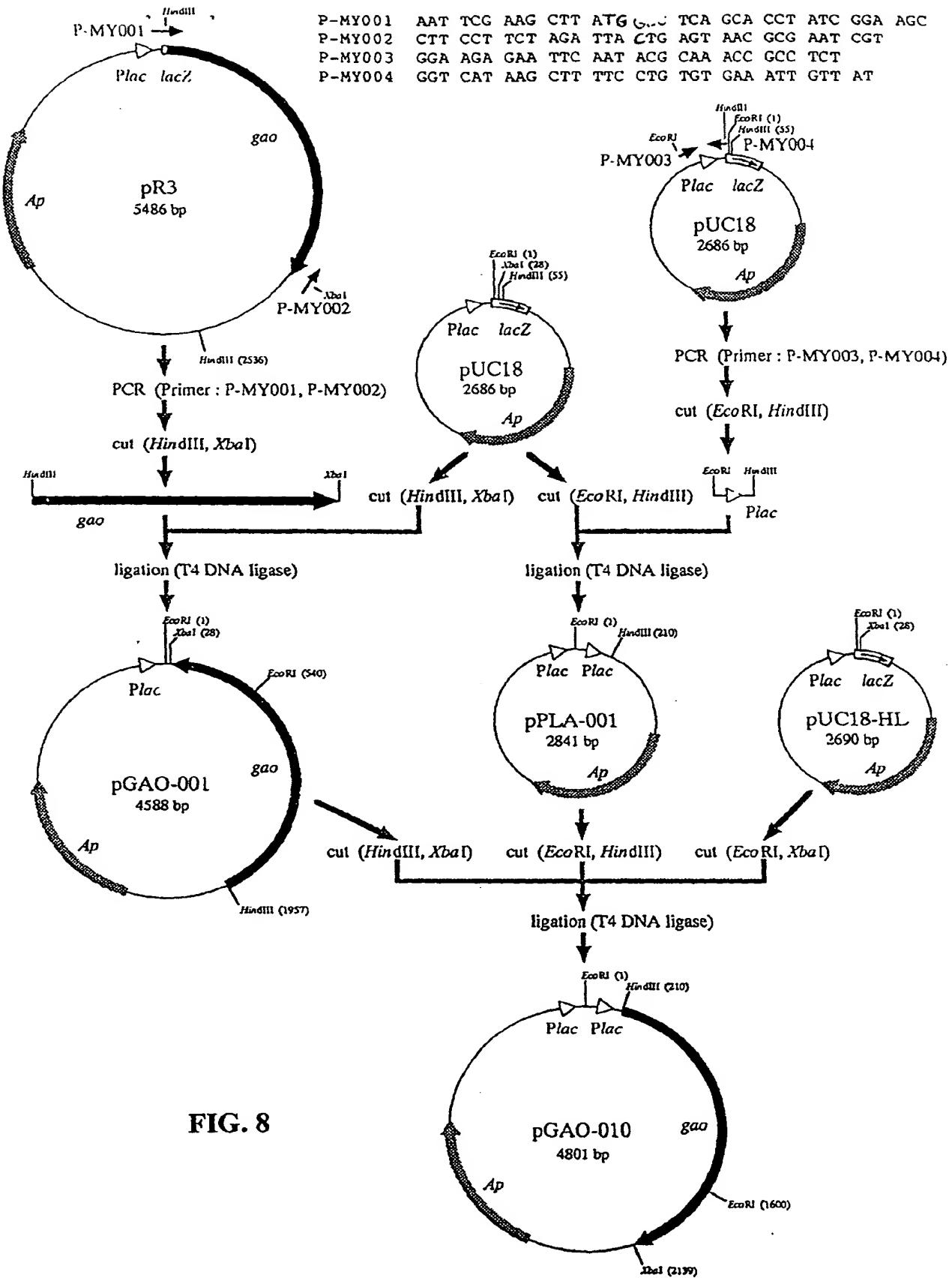


FIG. 8

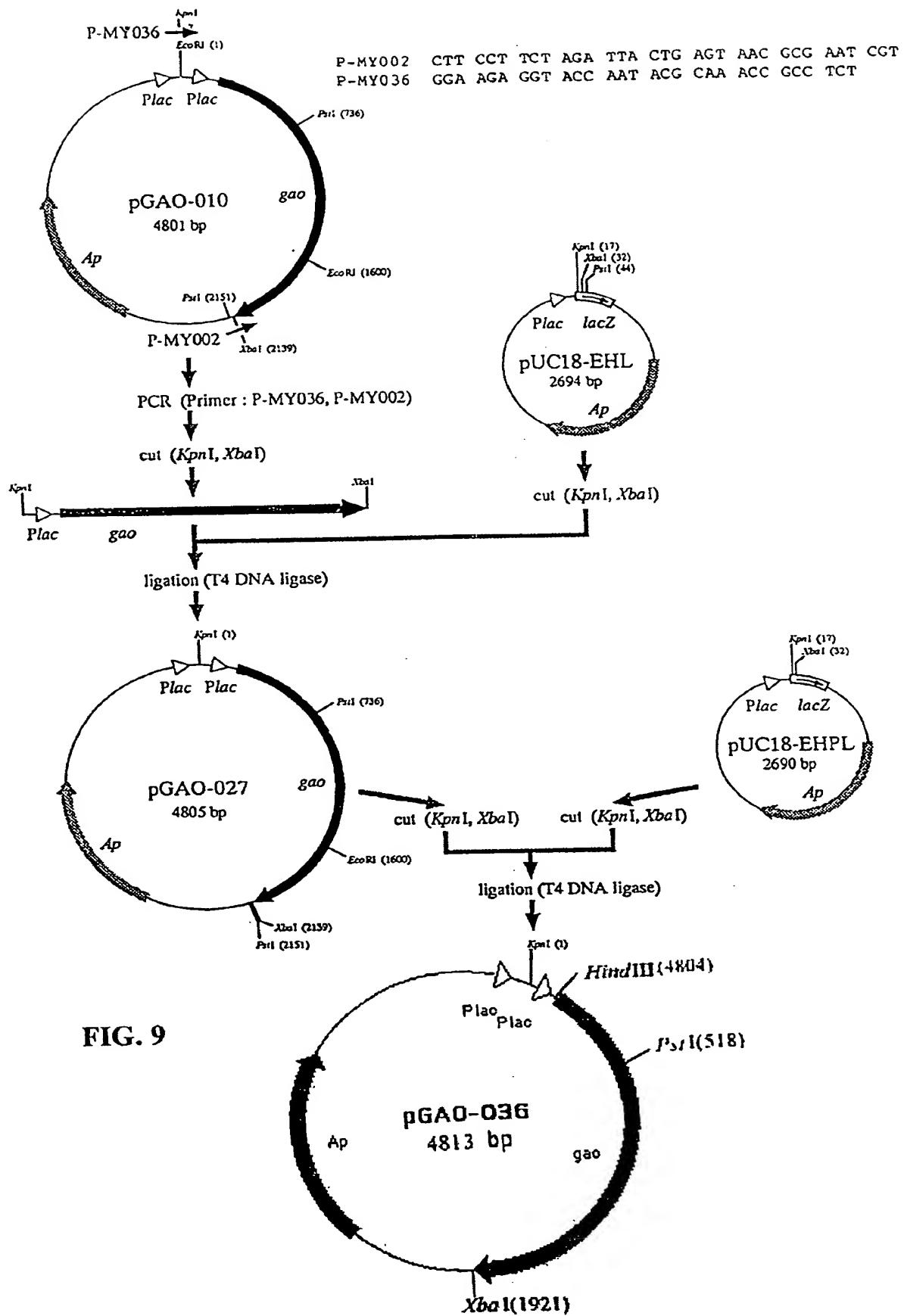


FIG. 9

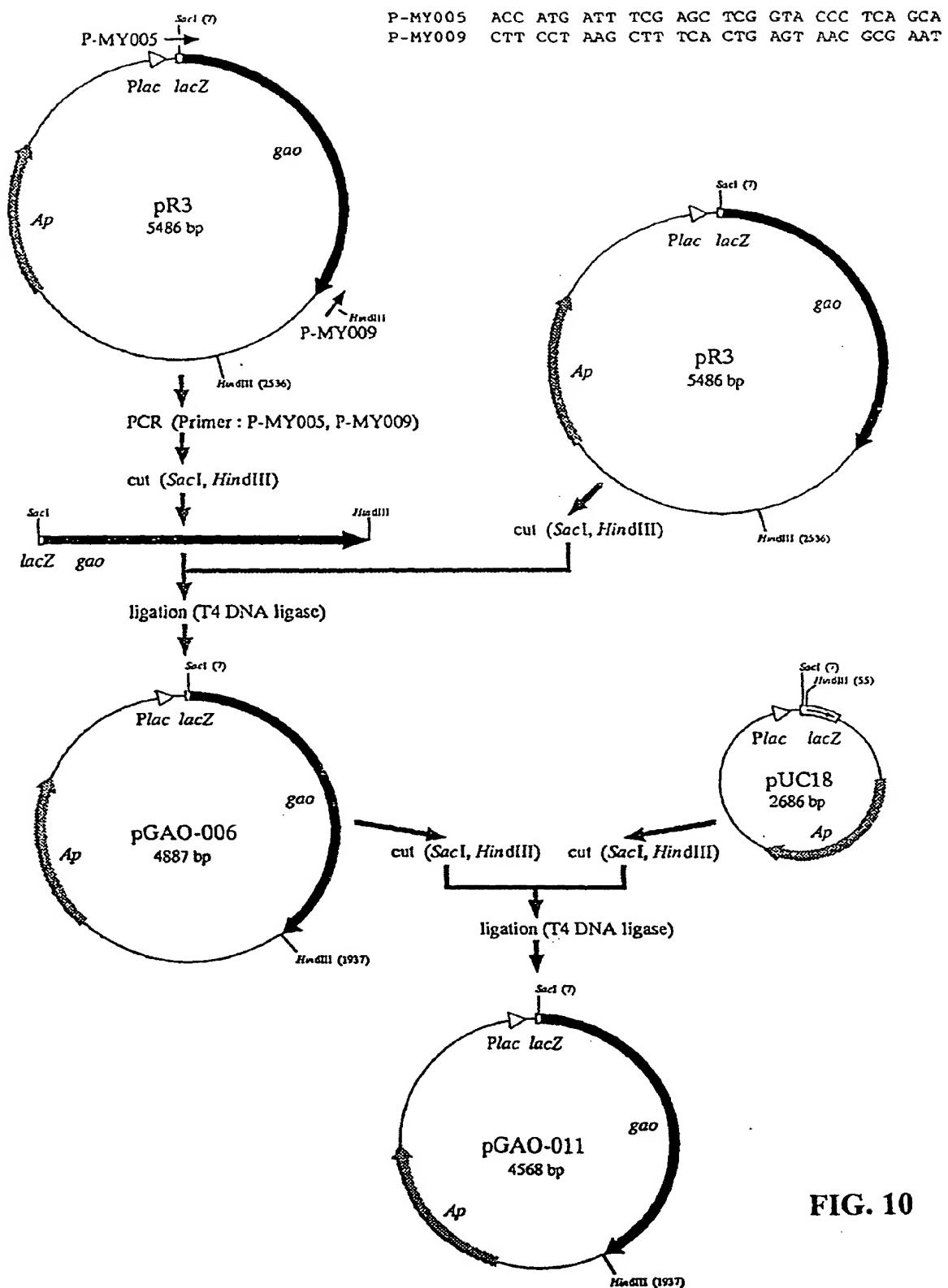


FIG. 10

FIG. 11

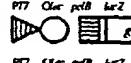
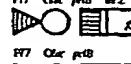
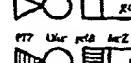
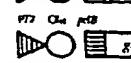
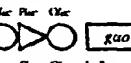
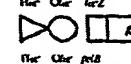
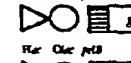
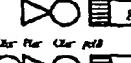
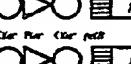
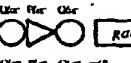
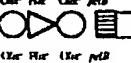
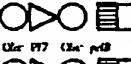
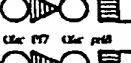
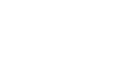
Plasmid	(vector)	GAO activities [units/ml-culture]					
		Host strain	DH5αMCR		BL21(DE3)		KY-14478
			Induction	-	IPTG	-	IPTG
pR3	(pUC118)		0	0.01	0.01	0.03	0.31
pGAO-003	(pET22b(+))		0	0	0	0	0
pGAO-004	(pET22b(+))		0	0	0	0	0
pGAO-005	(pET22b(+))		0	0	0	0	0
pGAO-006	(pUC118)		1.22	1.72	0.08	1.35	0.87
pGAO-007	(pET22b(+))		0.02	0	0.05	0	0
pGAO-008	(pET22b(+))		0	0	0.03	0.01	0
pGAO-009	(pET22b(+))		0	0	0.02	0.03	0
pGAO-010	(pUC18)		0	0	0.67	1.43	0.40
pGAO-011	(pUC18)		0.04	0.04	0.01	0.85	0.41
pGAO-014	(pUC18)		0	0.01	-**	-**	0
pGAO-015	(pUC18)		0	0	-**	-**	0
pGAO-016	(pUC18)		0.19	0.15	0.03	0.04	0
pGAO-017	(pUC18)		0	0	0.06	0.47	0.31
pGAO-018	(pUC18)		-*	-*	-**	-**	-**
pGAO-019	(pUC18)		-*	-*	-**	-**	-**
pGAO-020	(pUC18)		0	0.01	0.97	2.21	0.22
pGAO-021	(pUC18)		0.02	0	0.03	0.31	0.24
pGAO-022	(pUC18)		0.03	0.08	0.12	0.93	0.14
pGAO-023	(pUC18)		-*	-*	-**	-**	-*
pGAO-024	(pUC18)		-*	-*	-**	-**	-*

FIG. 12

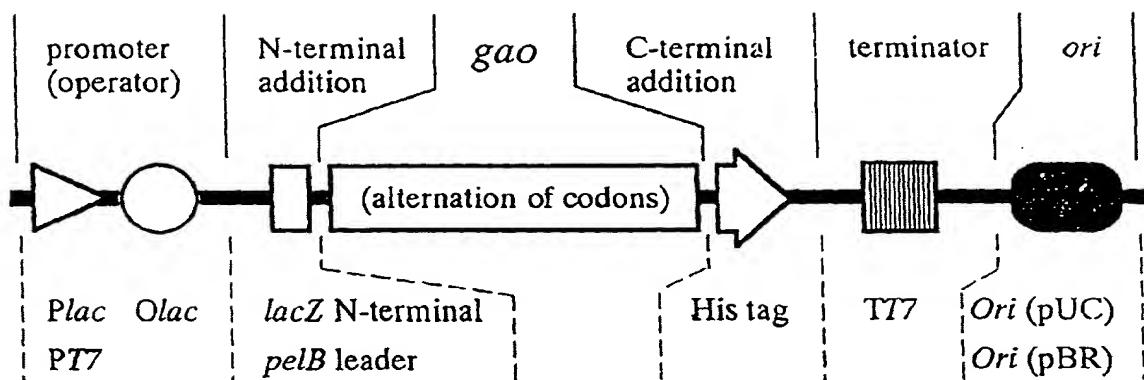


FIG. 13

Plasmid	GAO activity [units/ml] (+ IPTG)	
	BL21(DE3)	KY-14478
pGAO-011 (pUC18)	0.28	0.74
pGAO-025 (pUC18)	0.91	0.88
pGAO-010 (pUC18)	3.32	1.20
pGAO-027 (pUC18)	3.64	1.57
pGAO-028 (pUC18)	2.97	1.77

Diagram illustrating the different promoter arrangements for each plasmid:

- pGAO-011: P_{lac} O_{lac} LacZ (one P_{lac} and one O_{lac} followed by LacZ)
- pGAO-025: P_{lac} O_{lac} P_{lac} O_{lac} LacZ (two P_{lac} and two O_{lac} followed by LacZ)
- pGAO-010: P_{lac} O_{lac} P_{lac} O_{lac} (two P_{lac} and two O_{lac} without LacZ)
- pGAO-027: P_{lac} O_{lac} P_{lac} O_{lac} P_{lac} O_{lac} (three P_{lac} and three O_{lac} without LacZ)
- pGAO-028: P_{lac} O_{lac} P_{lac} O_{lac} P_{lac} O_{lac} (four P_{lac} and four O_{lac} without LacZ)

FIG. 14

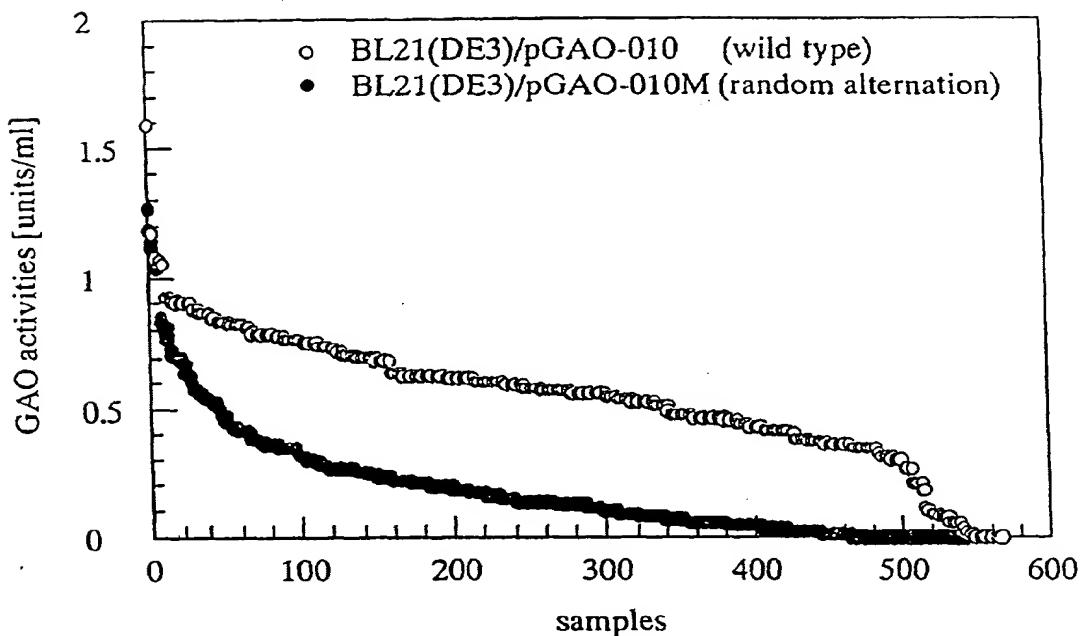
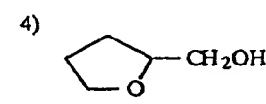
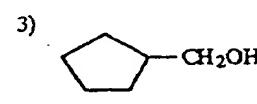
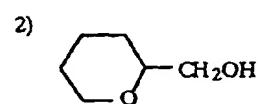
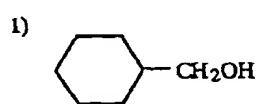


FIG. 15

Substrate (100 mM)	Rearrative activities of galactose oxidase [%]	
	<i>D. dendroides</i> (Sigma)	<i>E. coli</i> BL21(DE3)/pGAO-010
D-Galactose	100	100
D-Glucose	0	0
D-Sucrose	0	0
α -D-Lactose	20	17
β -D-Lactose	42	32
D-Raffinose	114	110
D-Melibiose	75	75
Benzyl alcohol (25 % Methanol)	15	11
2-Hydroxybenzyl alcohol	(+)	(+)
2-Pyridylcarbinol	14	15
3-Pyridylcarbinol	50	46
4-Pyridylcarbinol	32	29
Cyclohexylmethanol (45 % Methanol) 1)	1.9	2.1
Tetrahydropyran-2-methanol 2)	0	0
Cyclopentamethanol (30 % Methanol) 3)	0.42	0.25
Tetrahydrofurfuryl alcohol 4)	n.d.	n.d.
Glycerol	4.1	3.4
Ethylene glycol	0.45	0.16
1-Propanol	0	0
1,2-Propanediol	(+)	(+)
Acetol	13	13
Allyl alcohol	4.6	3.6



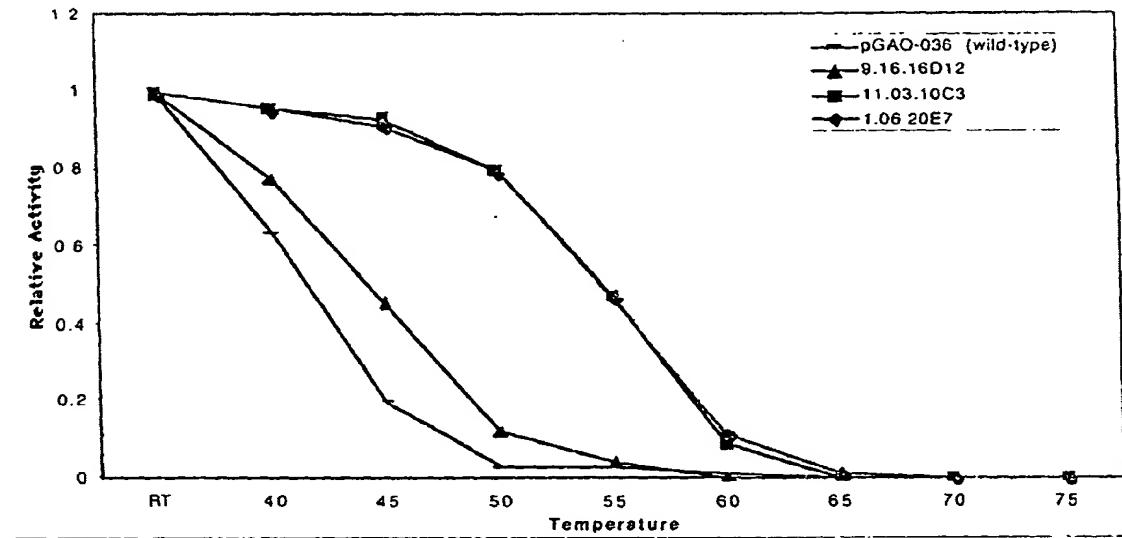


FIG. 16

Date : 2000.04.10
 Mutant ID : 9.16.8D2
 Mutation : N537D(A1609G)
 Sequence Size : 1917

FIG. 17A

10 20 30 40 50 60
 GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT
 A S A P I G S A I S R N N W A V T C D S

 70 80 90 100 110 120
 GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC
 A Q S G N E C N K A I D G N K D T F W H

 130 140 150 160 170 180
 ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG
 T F Y G A N G D P K P P H T Y T I D M K

 190 200 210 220 230 240
 ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC
 T T Q N V N G L S M L P R Q D G N Q N G

 250 260 270 280 290 300
 TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT
 W I G R H E V Y L S S D G T N W G S P V

 310 320 330 340 350 360
 GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT
 A S G S W F A D S T T K Y S N F E T R P

 370 380 390 400 410 420
 GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCT TGG ACT AGC ATT
 A R Y V R L V A I T E A N G Q P W T S I

 430 440 450 460 470 480
 GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC
 A E I N V F Q A S S Y T A P Q P G L G R

 490 500 510 520 530 540
 TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG
 W G P T I D L P I V P A A A A I E P T S

 550 560 570 580 590 600
 GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT
 G R V L M W S S Y R N D A F G G S P G G

 610 620 630 640 650 660
 ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA
 I T L T S S W D P S T G I V S D R T V T

 670 680 690 700 710 720
 GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA
 V T K H D M F C P G I S M D G N G Q I V

 730 740 750 760 770 780
 GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG
 V T G G N D A K K T S L Y D S S S D S W

 790 800 810 820 830 840
 ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC
 I P G P D M Q V A R G Y Q S S A T M S D

FIG. 17B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GCC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GTC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R V Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC GAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S D G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					

1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					
1810	1820	1830	1840	1850	1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG					
S Y S F Q V P S D S G V A L P G Y W M L					
1870	1880	1890	1900	1910	1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG					
F V M N S A G V P S V A S T I R V T Q					

FIG. 17C

Date : 2000.04.10
 Mutant ID : 9.16.6C11
 Mutation : V494A(T1481C), C515S(T1543A)
 Sequence Size : 1917

FIG. 18A

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCT TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 18B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT AGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L S G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L

1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 18C

Date : 2000.04.10
 Mutant ID : 9.16.16D12
 Mutation : P136(T408C), V494A(T1481C)
 Sequence Size : 1917

FIG. 19A

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCC TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 19B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT CGA GGC TCC TGG AGC GGT GGC GTC TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACC CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810	1820	1830	1840	1850	1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG					
S Y S F Q V P S D S G V A L P G Y W M L					
1870	1880	1890	1900	1910	1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG					
F V M N S A G V P S V A S T I R V T Q					

FIG. 19C

FIG. 20A

Date : 2000.04.13
 Mutant ID : 11.03.6D3
 Mutation : S10P(T28C), P136(T408C), V494A(T1481C)
 Sequence Size : 1917

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT CCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I P R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCC TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 20B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTC CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L
1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 20C

Date : 2000.04.10
 Mutant ID : 11.03.10C3
 Mutation : A3(A9C), P136(T408C), G195E(G584A), V494A(T1481C)
 Sequence Size : 1917

FIG. 21A

10	20	30	40	50	60
GCC TCA GCC CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCC TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GAA GGA TCC CCT GGT					
G R V L M W S S Y R N D A F E G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTC					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 21B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L

1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 21C

FIG. 22A

Date : 2000.04.10
 Mutant ID : 11.03.10D6
 Mutation : P136(T408C), T218(T654C), L312(A936G), V494A(T1481C), N535D(A1603G)
 Sequence Size : 1917

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCC TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACC GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 22B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTG CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC GAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y D S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CCC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810	1820	1830	1840	1850	1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG					
S Y S F Q V P S D S G V A L P G Y W M L					
1870	1880	1890	1900	1910	1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG					
F V M N S A G V P S V A S T I R V T Q					

FIG. 22C

FIG. 23A

Date : 2000.04.10
 Mutan ID : 11.03.13E12
 Mutation : M70V(A208G), P136(T408C), V494A(T1481C)
 Sequence Size : 1917

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT GTG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T O N V N G L S V L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCC TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A A I E P T S					
550	560	570	580	590	600
CGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 23B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A R I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT CTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L
1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 23C

FIG. 24A

Date : 2000.04.10
 Filename : 1.06.20E7
 Mutation : S10P(T28C), M70V(A208G), P136(T408C), G195E(G584A), V494A(T1481C)
 N535D(A1603G)
 Sequence Size : 1917

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT CCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I P R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT GTG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S V L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCC TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GAA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F E G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTC					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 24B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC AAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T N A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GCC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC GAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y D S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAC ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L

1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 24C

Date : 2000.04.11
 Mutant ID : 1.D4
 Mutation : N413D(A1237G)
 Sequence Size : 1917

FIG. 25A

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R . Q D G N Q N G					
250	260	270	280	290	300
TGG ATC CGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S M S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCT TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GCA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 25B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG AGC GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC GAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T D A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
E H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GTC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R V Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCT ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L
1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 25C

Date : 2000.04.11
 Mutant ID : 2.G4
 Mutation : N413D(A1237G), S550(T1650A)
 Sequence Size : 1917

FIG. 26A

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCT TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCA CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 26B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA CGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K C K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC GAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T D A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TIT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GTC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R V Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACC CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCA ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L
1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 26C

FIG. 27A

Date : 2000 04.11
 Mutant ID : 3.H7
 Mutation : N413D(A1237G), S550(T1650A), V494A(T1481C)
 Sequence Size : 1917

10	20	30	40	50	60														
GCC	TCA	GCA	CCT	ATC	GGG	AGC	GCC	ATT	TCT	CGC	AAC	AAC	TGG	GCC	GTC	ACT	TGC	GAC	AGT
A	S	A	P	I	G	S	A	I	S	R	N	N	W	A	V	T	C	D	S
70	80	90	100	110	120														
GCA	CAG	TCG	GGA	AAT	GAA	TGC	AAC	AAG	GCC	ATT	GAT	GGC	AAC	AAG	GAT	ACC	TTT	TGG	CAC
A	Q	S	G	N	E	C	N	K	A	I	D	G	N	K	D	T	F	W	H
130	140	150	160	170	180														
ACA	TTC	TAT	GGC	GCC	AAC	GGG	GAT	CCA	AAG	CCC	CCT	CAC	ACA	TAC	ACG	ATT	GAC	ATG	AAG
T	F	Y	G	A	N	G	D	P	K	P	P	H	T	Y	T	I	D	M	K
190	200	210	220	230	240														
ACA	ACT	CAG	AAC	GTC	AAC	GGC	TTG	TCT	ATG	CTG	CCT	CGA	CAG	GAT	GGT	AAC	CAA	AAC	GGC
T	T	Q	N	V	N	G	L	S	M	L	P	R	Q	D	G	N	Q	N	G
250	260	270	280	290	300														
TGG	ATC	GGT	CGC	CAT	GAG	GTT	TAT	CTA	AGC	TCA	GAT	GGC	ACA	AAC	TGG	GGC	AGC	CCT	GTT
W	I	G	R	H	E	V	Y	L	S	S	D	G	T	N	W	G	S	P	V
310	320	330	340	350	360														
GCG	TCA	GGT	AGT	TGG	TTC	GCC	GAC	TCT	ACT	ACA	AAA	TAC	TCC	AAC	TTT	GAA	ACT	CGC	CCT
A	S	G	S	W	F	A	D	S	T	T	K	Y	S	N	F	E	T	R	P
370	380	390	400	410	420														
GCT	CGC	TAT	GTT	CGT	CTT	GTC	GCT	ATC	ACT	GAA	GCG	AAT	GGC	CAG	CCT	TGG	ACT	AGC	ATT
A	R	Y	V	R	L	V	A	I	T	E	A	N	G	Q	P	W	T	S	I
430	440	450	460	470	480														
GCA	GAG	ATC	AAC	GTC	TTC	CAA	GCT	AGT	TCT	TAC	ACA	GCC	CCC	CAG	CCT	GGT	CTT	GGA	CGC
A	E	I	N	V	F	Q	A	S	S	Y	T	A	P	Q	P	G	L	G	R
490	500	510	520	530	540														
TGG	GGT	CCG	ACT	ATT	GAC	TTA	CCG	ATT	GTT	CCT	GCG	GCT	GCA	GCA	ATT	GAA	CCG	ACA	TCG
W	G	P	T	I	D	L	P	I	V	P	A	A	A	A	I	E	P	T	S
550	560	570	580	590	600														
GGA	CGA	GTC	CTT	ATG	TGG	TCT	TCA	TAT	CGC	AAT	GAT	GCA	TTT	GGA	GGA	TCC	CCT	GGT	GGT
G	R	V	L	M	W	S	S	Y	R	N	D	A	F	G	G	S	P	G	G
610	620	630	640	650	660														
ATC	ACT	TTG	ACG	TCT	TCC	TGG	GAT	CCA	TCC	ACT	GGT	ATT	GTT	TCC	GAC	CGC	ACT	GTG	ACA
I	T	L	T	S	S	W	D	P	S	T	G	I	V	S	D	R	T	V	T
670	680	690	700	710	720														
GTC	ACC	AAG	CAT	GAT	ATG	TTC	TGC	CCT	GGT	ATC	TCC	ATG	GAT	GGT	AAC	GGT	CAG	ATC	GTA
V	T	K	H	D	M	F	C	P	G	I	S	M	D	G	N	G	Q	I	V
730	740	750	760	770	780														
GTC	ACA	GGT	GGC	AAC	GAT	GCC	AAG	AAG	ACC	AGT	TTG	TAT	GAT	TCA	TCT	AGC	GAT	AGC	TGG
V	T	G	G	N	D	A	K	K	T	S	L	Y	D	S	S	S	D	S	W
790	800	810	820	830	840														
ATC	CCG	GGA	CCT	GAC	ATG	CAA	GTG	GCT	CGT	GGG	TAT	CAG	TCA	TCA	GCT	ACC	ATG	TCA	GAC
I	P	G	P	D	M	Q	V	A	R	G	Y	Q	S	S	A	T	M	S	D

FIG. 27B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC GAC GCC CAC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T D A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACC					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCA ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCT GGT GTT GCT TTG CCT GCC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M M L
1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 27C

FIG. 28A

Date : 2000.04.11
 Mutant ID : 4.F12
 Mutation : N413D(A1237G), S550(T1650A), V494A(T1481C), S610(T1830A)
 Sequence Size : 1917

10	20	30	40	50	60
GCC TCA GCA CCT ATC GGA AGC GCC ATT TCT CGC AAC AAC TGG GCC GTC ACT TGC GAC AGT					
A S A P I G S A I S R N N W A V T C D S					
70	80	90	100	110	120
GCA CAG TCG GGA AAT GAA TGC AAC AAG GCC ATT GAT GGC AAC AAG GAT ACC TTT TGG CAC					
A Q S G N E C N K A I D G N K D T F W H					
130	140	150	160	170	180
ACA TTC TAT GGC GCC AAC GGG GAT CCA AAG CCC CCT CAC ACA TAC ACG ATT GAC ATG AAG					
T F Y G A N G D P K P H T Y T I D M K					
190	200	210	220	230	240
ACA ACT CAG AAC GTC AAC GGC TTG TCT ATG CTG CCT CGA CAG GAT GGT AAC CAA AAC GGC					
T T Q N V N G L S M L P R Q D G N Q N G					
250	260	270	280	290	300
TGG ATC GGT CGC CAT GAG GTT TAT CTA AGC TCA GAT GGC ACA AAC TGG GGC AGC CCT GTT					
W I G R H E V Y L S S D G T N W G S P V					
310	320	330	340	350	360
GCG TCA GGT AGT TGG TTC GCC GAC TCT ACT ACA AAA TAC TCC AAC TTT GAA ACT CGC CCT					
A S G S W F A D S T T K Y S N F E T R P					
370	380	390	400	410	420
GCT CGC TAT GTT CGT CTT GTC GCT ATC ACT GAA GCG AAT GGC CAG CCT TGG ACT AGC ATT					
A R Y V R L V A I T E A N G Q P W T S I					
430	440	450	460	470	480
GCA GAG ATC AAC GTC TTC CAA GCT AGT TCT TAC ACA GCC CCC CAG CCT GGT CTT GGA CGC					
A E I N V F Q A S S Y T A P Q P G L G R					
490	500	510	520	530	540
TGG GGT CCG ACT ATT GAC TTA CCG ATT GTT CCT GCG GCT GCA GCA ATT GAA CCG ACA TCG					
W G P T I D L P I V P A A A I E P T S					
550	560	570	580	590	600
GGA CGA GTC CTT ATG TGG TCT TCA TAT CGC AAT GAT GCA TTT GGA GGA TCC CCT GGT GGT					
G R V L M W S S Y R N D A F G G S P G G					
610	620	630	640	650	660
ATC ACT TTG ACG TCT TCC TGG GAT CCA TCC ACT GGT ATT GTT TCC GAC CGC ACT GTG ACA					
I T L T S S W D P S T G I V S D R T V T					
670	680	690	700	710	720
GTC ACC AAG CAT GAT ATG TTC TGC CCT GGT ATC TCC ATG GAT GGT AAC GGT CAG ATC GTA					
V T K H D M F C P G I S M D G N G Q I V					
730	740	750	760	770	780
GTC ACA GGT GGC AAC GAT GCC AAG AAG ACC AGT TTG TAT GAT TCA TCT AGC GAT AGC TGG					
V T G G N D A K K T S L Y D S S S D S W					
790	800	810	820	830	840
ATC CCG GGA CCT GAC ATG CAA GTG GCT CGT GGG TAT CAG TCA TCA GCT ACC ATG TCA GAC					
I P G P D M Q V A R G Y Q S S A T M S D					

FIG. 28B

850	860	870	880	890	900
GGT CGT GTT TTT ACC ATT GGA GGC TCC TGG AGC GGT GGC GTA TTT GAG AAG AAT GGC GAA					
G R V F T I G G S W S G G V F E K N G E					
910	920	930	940	950	960
GTC TAT AGC CCA TCT TCA AAG ACA TGG ACG TCC CTA CCC AAT GCC AAG GTC AAC CCA ATG					
V Y S P S S K T W T S L P N A K V N P M					
970	980	990	1000	1010	1020
TTG ACG GCT GAC AAG CAA GGA TTG TAC CGT TCA GAC AAC CAC GCG TGG CTC TTT GGA TGG					
L T A D K Q G L Y R S D N H A W L F G W					
1030	1040	1050	1060	1070	1080
AAG AAG GGT TCG GTG TTC CAA GCG GGA CCT AGC ACA GCC ATG AAC TGG TAC TAT ACC AGT					
K K G S V F Q A G P S T A M N N W Y Y T S					
1090	1100	1110	1120	1130	1140
GGA AGT GGT GAT GTG AAG TCA GCC GGA AAA CGC CAG TCT AAC CGT GGT GTA GCC CCT GAT					
G S G D V K S A G K R Q S N R G V A P D					
1150	1160	1170	1180	1190	1200
GCC ATG TGC GGA AAC GCT GTC ATG TAC GAC GCC GTT AAA GGA AAG ATC CTG ACC TTT GGC					
A M C G N A V M Y D A V K G K I L T F G					
1210	1220	1230	1240	1250	1260
GGC TCC CCA GAT TAT CAA GAC TCT GAC GCC ACA ACC GAC GCC CAC ATC ATC ATC ACC CTC GGT					
G S P D Y Q D S D A T T D A H I I T L G					
1270	1280	1290	1300	1310	1320
GAA CCC GGA ACA TCT CCC AAC ACT GTC TTT GCT AGC AAT GGG TTG TAC TTT GCC CGA ACG					
E P G T S P N T V F A S N G L Y F A R T					
1330	1340	1350	1360	1370	1380
TTT CAC ACC TCT GTT GTT CTT CCA GAC GGA AGC ACG TTT ATT ACA GGA GGC CAA CGA CGT					
F H T S V L P D G S T F I T G G Q R R					
1390	1400	1410	1420	1430	1440
GGA ATT CCG TTC GAG GAT TCA ACC CCG GTA TTT ACA CCT GAG ATC TAC GTC CCT GAA CAA					
G I P F E D S T P V F T P E I Y V P E Q					
1450	1460	1470	1480	1490	1500
GAC ACT TTC TAC AAG CAG AAC CCC AAC TCC ATT GTT CGC GCC TAC CAT AGC ATT TCC CTT					
D T F Y K Q N P N S I V R A Y H S I S L					
1510	1520	1530	1540	1550	1560
TTG TTA CCT GAT GGC AGG GTA TTT AAC GGT GGT GGT CTT TGT GGC GAT TGT ACC ACG					
L L P D G R V F N G G G L C G D C T T					
1570	1580	1590	1600	1610	1620
AAT CAT TTC GAC GCG CAA ATC TTT ACG CCA AAC TAT CTT TAC AAT AGC AAC GGC AAT CTC					
N H F D A Q I F T P N Y L Y N S N G N L					
1630	1640	1650	1660	1670	1680
GCG ACA CGT CCC AAG ATT ACC AGA ACC TCA ACA CAG AGC GTC AAG GTC GGT GGC AGA ATT					
A T R P K I T R T S T Q S V K V G G R I					
1690	1700	1710	1720	1730	1740
ACA ATC TCG ACG GAT TCT TCG ATT AGC AAG GCG TCG TTG ATT CGC TAT GGT ACA GCG ACA					
T I S T D S S I S K A S L I R Y G T A T					
1750	1760	1770	1780	1790	1800
CAC ACG GTT AAT ACT GAC CAG CGC CGC ATT CCC CTG ACT CTG ACA AAC AAT GGA GGA AAT					
H T V N T D Q R R I P L T L T N N G G N					

1810 1820 1830 1840 1850 1860
AGC TAT TCT TTC CAA GTT CCT AGC GAC TCA GGT GTT GCT TTG CCT GGC TAC TGG ATG TTG
S Y S F Q V P S D S G V A L P G Y W M L
1870 1880 1890 1900 1910 1920
TTC GTG ATG AAC TCG GCC GGT GTT CCT AGT GTG GCT TCG ACG ATT CGC GTT ACT CAG
F V M N S A G V P S V A S T I R V T Q

FIG. 28C

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